

Interactive comment on “A statistical study of spatial distribution and source region size of chorus waves using Van Allen Probes data” by Shangchun Teng et al.

Anonymous Referee #1

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A statistical study of spatial distribution and source region size of chorus waves using Van Allen Probes data by Shangchun Teng et al. examines the spatial distribution of rising and falling tone chorus, plus the chorus source region size using the Van Allen Probe EMFISIS burst data. The paper presents new and interesting results and it should be published after the authors take into consideration the following comments/suggestions.

Page 3, first paragraph, you might want to include/discuss Taubenschuss et al., 2015 results in your intro since they also looked at rising and falling tones in the THEMIS data

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Taubenschuss, U., Y. V. Khotyaintsev, O. Santolík, A. Vaivads, C. M. Cully, O. Le Contel, and V. Angelopoulos (2015), Wave normal angles of whistler mode chorus rising and falling tones, *J. Geophys. Res. Space Physics*, 119, 9567–9578, doi:10.1002/2014JA020575.

Page 3, Line 29: What were the parameters of your fft? How many samples? Any overlap? I think it would be good to state/discuss what you did since it can make a big difference on the resolution and the types of structure you will see in the spectra.

Page 4, Line 6: How is a chorus event (rising or falling) exactly defined? Is only a single element needed in a snapshot to be an event, or a number of elements? How “clear” does the element need to be to be defined as a riser or a faller? For example, in your Figure 1a, I think I can see rising elements buried in the broad band more hiss like structure, but from your test I believe this type of event was excluded from your chorus list. Can a 6 second snapshot period have both rising and falling tones? Please describe your methodology in more detail so we can better understand your process on determining a riser and/or faller event. Also, from my experience with the EMFISIS burst data, I am a little surprised there were that many falling tone events, so I want to be sure I understand how they were defined.

Page 5, Line 24: I think you need to describe how you determine the electron density. Are you using the UHR band (Kurth et al., 2015), the EFW proxy density, or some other method? The Kurth reference is below in case that is what you are using. Kurth, W. S., De Pascuale, S., Faden, J. B., Kletzing, C. A., Hospodarsky, G. B., Thaller, S. and Wygant, J. R. (2015), Electron densities inferred from plasma wave spectra obtained by the Waves instrument on Van Allen Probes. *J. Geophys. Res. Space Physics*, 120: 904–914. doi: 10.1002/2014JA020857.

Minor suggestions

Page 3, Line 28: I believe the sampling rate for the EMFISIS burst is set at 35 kHz and cannot be modified, so I would replace “up to” with “of”

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Figure 1 and 4: I would put the time and date of these data so the reader could plot the original data if they wanted to do their own analysis to compare to your plots.

Interactive comment on Ann. Geophys. Discuss., <https://doi.org/10.5194/angeo-2018-16>, 2018.

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